

Investigate mechanisms – gears

Mission Objectives

Investigate mechanisms – gears

Learning outcomes

To explain how gears allow a smaller force to have greater effect

Higher: I can explain how gears convert a force.

Middle: I can make simple gears and explain how they work.

Lower: I can identify gears in a range of everyday items.

Activities

Mission Starter - Engage

Method:

Discuss how gears are changing direction in the video.

Develop into discussion about gears - where do we find gears and do pupils know what gears can do?

Resources:

Presentation - starter slide.

The Story - Explore and Explain

Method:

Run through presentation about gears and how the gears / mechanisms work when force is applied. Ask questions as suggested throughout presentation.

Stop the presentation at the relevant slides: Talk Partners; AfLs; Songs.

Resources:

Presentation

Mission Expert - Explain

Method:

In today's film Adam Linden from Hever Iron Works talks about the gears involved with operating a furnace.

Resources:

Presentation - expert film.

Mission Assignment - Elaborate

Method:

Create a Set of Gears

Watch today's mission assignment film.

Process:

Get some cardboard, some masking tape and some straws.

Cut out some disc shapes from the cardboard, and create some 'gears' of different sizes on them, by placing straws into it at intervals.

On another sheet of cardboard, a larger one, place some holes at intervals so that the gears would touch each other when one of them moves around. You can make as many gears as you like. Use a pencil as the turning mechanism in the cardboard, and see how many gears you can make move independently by turning the first one.

Resources:

Create a Set of Gears

Cardboard

Straws

Masking Tape

Pencil

Mission Log - Evaluate

Method:

Handout

Ask the pupils to record what they do in diagrams with arrows and labels and ask them to write an 'if ___ then ___ because ___' sentence about the size of the cog and its rotation.

Ask the pupils to record what they do in labelled diagrams, showing the number of rotations of each gear, with arrows to indicate the direction in which each gear turns. Ask them to write two 'If ___ then ___ because ___' sentences about what they have done.

Quiz

With their talk partners, the children are to go through the quiz at the end of the presentation and answer the questions.

Resources:

Handout

Quiz in presentation

Assessment

Questions to Ask During the Lesson

Ask children if they know what gears are and what they do?

Can children think of any gears they and their parents use?

Can they explain how gears interact and work with each other?

Do children understand that the size of the gears affects the speed of other gears and how gear change the direction of movement?

Do they understand that a large gear makes a smaller one rotate much faster and vice versa?

Can they identify gears that are used in everyday life?

Mark Allocation

Quizzes available in pupil zone.

Unit knowledge organisers and tests available in documents area.

Choral Response Questions/ Phrase Suggestions

Gears can help you to...

Gears work by...

If you change gear on your bike, it allows you to...

Teacher Mastery

The Science Behind the Science:

Gears are pretty much wheels that have teeth. Machines usually use gears of different sizes to move something. There are many different machines that operate with gears. Examples of this include: bicycles, wind-up toys and non-digital clocks. Machines will tend to have one gear that is larger than the other. The smaller one rotates a lot faster than the larger one but it is the larger gear that has a lot more teeth. The difference in size is useful in saving energy. It is the bigger gear that drives the smaller gear, which helps it to move a lot quicker. The larger gear remains moving slowly so that both effort and energy are saved. Having two gears increasing the turning force. The larger gear will continue to move slowly even with increased force. The smaller gear moves quicker with an increased force.

The gears on a bike are usually connected by a chain. It is the chain that allows the force for the pedals to make the wheels move. This is what allows the bike to move along when you pedal. You can change gears on a proper bike just as you can in a car. The chain can be changed between the different gears. This can be for racing where a quicker speed is required or just for increased force when riding up a hill.

Curriculum Fields

National Curriculum

Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect and explore the effects of levers, pulleys and simple machines on movement.

International Baccalaureate

Forces and Energy: the study of energy, its origin, storage and transfer and the work it can do; the study of forces; the application of scientific understanding through inventions and machines.

Scientific Enquiry Type

Noticing patterns

Working Scientifically Skills

Recording data and results of increasing complexity using scientific diagrams and labels, classifications, keys, tables, scattergraphs and bar and line graphs

CBSE

Grade 5 - Simple Machines